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# Review of Construction Equipment Management System at Construction Sites

**Asegid Tadesse[1], Srinivas Kumar[2], Krishna[3]**

[1]*Lecturer, Department of Mechanical Engineering, Wollega University, Nekemte, Ethiopia.*

[2]*Assistant professor, Department of Mechanical Engineering, Wollega University, Nekemte, Ethiopia.*

[3]*Assistant professor, Department of Mechanical Engineering, Vedantha Institute of Technology, Villupuram, India.*

*Corresponding Author: krishnav1989@gmail.com*

**Abstract:** This paper reviews research and development activities conducted over the past few decades on construction equipment management practices. It studies the prevention of vacuum created by the lack of proper material handling at construction sites. It is on the analysis of factors that affect the effective material management in building construction projects. Materials management is an important tool and factor in project management and control to improve productivity in construction projects. In order to execute a building project effectively, it is important to have the right materials in the right place at the right time. Many researchers have shown that construction materials and equipment can make up more than 60-70% of the total cost for a typical construction project. Improper handling and maintenance of materials on site can adversely affect project cost. Materials management practices need to be implemented on construction industry projects. A properly implemented materials management program can achieve a timely flow of materials and equipment for employment, resulting in better planning, increased labor productivity, better scheduling and lower project costs. In addition, proper maintenance of the material component improves the productivity and cost efficiency of a project and helps in completing construction projects on time and efficiently. One of the major problems of delay in construction projects is maintenance of materials and equipment. Therefore, it is necessary to study and implement material management practices in all construction industries. However, this review focuses on the various content management methods adopted on paper sites and discusses the advantages and disadvantages of content management on construction sites.

**Key Words: -** ***Construction Materials, Construction site, Material Management.***

## I. INTRODUCTION

Materials management is a process for planning, implementing and controlling field and office activities in the construction industry. Construction projects depend on having the right people with the right skills and equipment to be able to deliver the project on time and on budget [1]. In the construction sector, the total cost of the project is divided into parameters such as cost of materials, manpower, equipment. It is the planning and control system of all the efforts required to ensure the proper quality and quantity of material. Properly. Timely specifics are obtained at a reasonable cost and are especially available during use when needed. The main objective of this study is to provide the right material at the right time and place, so that it fits the exact demand when needed. Materials represent the main cost in the construction industry. Therefore, reducing collection costs increases the chances of reducing the overall cost of the project [2]. Materials management plays an important role in every construction industry for the successful completion of construction projects. Every construction company needs knowledge of management techniques and their implications to complete the work successfully. Construction equipment maintenance may involve increased costs during construction. Efficient materials management can lead to significant savings in project costs. Materials may deteriorate or be stolen during storage if special care is not taken. Ensuring timely flow of materials is an important concern of materials management. For effective management and control procedures of materials, the performance of all tasks in materials management should be measured. Performance measurement indirectly calculates the effectiveness of the work. This performance measurement varies from system to system depending on the type and capacity of the project work. Performance measurement divides the content management system into parts and makes the system work more efficiently. In the Materials Management Program, the appropriate operation can achieve an adequate availability of materials and machinery at the construction site, thereby meeting the need for work at the planning stage, thus increasing labor productivity, better scheduling and minimum project costs. In general, material management can be defined as the process of using, implementing and controlling the right resources at the right cost, at the right time, with the highest quality production process at the lowest cost. Content management integrates purchasing, shipping and content control from suppliers to end users. Based on this, the Materials Management Division also oversees marketing, purchasing, inventory control, store management and staff

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selection to deal with their training and hiring of equipment. This indicates that the material management department of any organization is very important to support the organization in production activities. It assists in marketing, sales promotion and control of all types of materials for its quantity, quality and cost. Therefore, this review document helps to identify the factors that affect material management on the construction site and to suggest remedial actions on it. In addition, the study looks at small, medium and large general content management processes Scale construction companies on construction sites and we analyze elements in three-dimensional construction companies. Some remedial measures are suggested at the end of the study to overcome these factors.

## II. Literature Review

Researchers study construction material management at construction sites and they bring different results to it. From those studies, et.al N.B. Qasim one and he said it was important to maintain all materials from the design stage until the construction phase was completed. He noted that it is important to develop new approaches to material handling in fast track construction projects to improve the efficiency of the production process. Again et.al dr. Kevin Okorocha, Statistics, Civilized Equipment Management Profits for the construction industry [3]. According to another study by Ashwini Patil, construction materials are a major expense in any construction project. The total cost of the material may be 50% of the total cost; It is important to consider the timely availability of contractor material as a factor in the successful completion of any project [3] in the operation of a construction project. According to Fani Madhavi, project costs fluctuate frequently. Materials, equipment, manpower, subcontractor overhead costs and general condition [4]. Therefore, if content management is not handled properly, it can create a big change in project cost. Project cost can be controlled by taking corrective action towards cost difference. Allocating important resources such as money, staff, time, etc. is very necessary to process monitoring and control. AA in the last Gulghen. He explained that for greater efficiency and effectiveness on the construction site, changes in material management processes are needed for overall improvement in material management [5]. Improper handling of construction materials affects the overall performance of construction projects in terms of cost, time, quality and productivity. Materials management can be defined as the process of planning, estimating materials, estimating materials, sourcing, purchasing, transporting, storing and controlling materials, reducing waste, and coordinating material use. Optimizes profitability by reducing costs. Construction materials cost 60 to 70 percent of a project or direct facility, with the remaining 30 to 40 percent labor costs. As project management, special training sessions should be arranged on site to keep workers updated on the latest technologies. The plant and machinery should be inspected regularly to prevent any failure. Workers and contractors must be sent in the proper manner to perform a task. Regular inspections should be kept in the plan to correct any errors. Proper monitoring of the site should be done to improve the performance level. Taylor (1913) stated that the economic losses caused by physical waste are related to the inefficiency of human work. Ford (1927) also suggested that human work should be central to wasteful assembly, because the value of materials depends largely on the work expended on them. Berliner B noted that project control in most companies is largely based on financial performance measures, which are lagging-centered and it is not easy to determine operating costs. Material movement, cost estimates, supplier development, new materials, safety margins, materials distribution, inventory control activities, materials order, standard component use and related items are given under Determination of Materials Management.

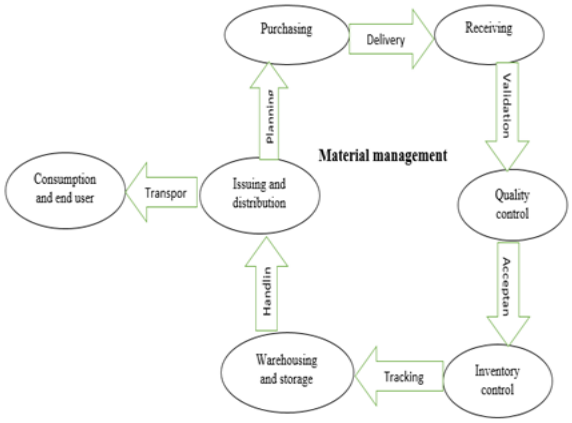


Fig.1. Flow of material management

## III. Benefits Of Material Management

Content management offers many benefits for all functions that integrate with building materials. It improves labor productivity, improves project scheduling, improves quality control, improves field materials control, establishes better relationships with suppliers, achieves better management, minimizes excessive delays, reduces construction quality, overall cost, minimizes technical issues, and eliminates overall project costs. decreases. Etc. There are some advantages of material handling.

Furthermore, in order to fulfill the objectives of content management as mentioned above and to fulfill the primary goals and objectives, the tasks of content management are

classified as primary and secondary tasks. Its main functions are requirements planning (MRP), procurement, inventory planning and control, identifying and maintaining the flow and supply of materials and quality control. Some secondary functions of authentication, evaluation and planning content management. Responsibility for material management begins with the flow of materials, including the manufacturing, finishing, receiving, and storage processes. Meaning, to make site maintenance for fast track projects less costly, there must be an integrated material handling process for the end user of the material from the design stage. The effective collection of materials represents a key role in the successful completion of the work, to ensure that the materials are available in their use when needed. The three key steps that make up the key to successful content management are the purchase, use and storage of materials.

George Kutty (2012) reviewed the literature to find out the reasons for the project's incompleteness. Questionnaire survey was conducted in Kerala. Through research, major delays or incompleteness of the project can be resolved through proper advance planning and the purchase of materials can be frequently checked to minimize more than the cost of the project. Fanny Madhavi (2013) did a case study on materials management at the construction site. The aim of the study is to understand all the problems that occur in the organization due to improper application of materials management. Analysis of site and maintenance, inventory control, procurement processes, collection and tracking and cost. Stocks are analyzed by FIFO (First in First Out Method). The cost is estimated by ABC analysis. From the analysis, the data was implemented and new relevant technical implications such as RFID (Radio Frequency Identification), PDA (Personal Digital Assistant) were introduced to assist us in proper scheduling and financial control.

Siddharth Nair (2014) made clear the benefits of content management to the organization through his paper. The author points out that the objective of material management is to supply raw materials regularly, maintain a high inventory turnover, provide purchasing economies and reduce waste, and reduce the total cost of acquisition and contribution. And maintain a high level of coordination. User section. The main advantages of material management are that high investments in stocks do not go unnoticed, material shortages do not lead to stagnation, productivity improves, inventory losses are reduced and waste is reduced. Olusakin S. Akindipe (2014) conducted a study on the management role of raw materials in production activities. The author is aware of the inefficiency in the management of raw materials and the alternative solutions to overcome the problem. He discovered the relationship between raw materials and inventory management to solve the crisis. From this he concluded that illiteracy and non-expert involvement in disability management, such as misuse of materials and inability to use a proper inventory model on site.

### *A. Basic Constituents of Material Management:*

As we have seen before, materials are an important factor in planning and control in the construction industry and this represents a major cost to the industry. Therefore, there are four basic components to managing materials: purchasing, material handling, storekeeping and recycling or disposal. Material assessment, budgeting, planning and programming, scheduling, collection and procurement and inspection, inventory control, storage and storage and waste management are its other basic components.

Finally, systematic operation, reduction in cost management, reduction of overall cost of the project, increased labor productivity, time management, quality control, better relationship with suppliers and better relationship with customers are the characteristics of content management.

### *B. Data collection and analysis:*

This review includes a questionnaire and survey study with previous written papers and research papers related to data collection. A total of 15 companies (5 small, 5 medium and 5 large) were randomly selected for this review. Data collected from the questionnaire survey and related data were systematically and properly studied. According to the data collected, it was found that there are some defects in the materials management system of the three dimensional construction companies, which are affected by the management system.

## IV. OBSERVATION AND DISCUSSION

### *A. Observation:*

From the investigation, it appears that only large organizations use specific content management practice and that somehow, they prepare material data sheets for content management and that they have technical people for any rules or management and management. The person initiates the appropriate action to solve the problem. On the other hand, medium and small companies are less involved in content management practice. Back then, some large companies did not have a content management technical department, especially for small and medium-sized production companies. But in comparison, any type of large construction company is better at materials handling practice and management techniques than medium and small companies. However, they still face a lot of problems for proper maintenance and control over site tasks. Lack of material management can eventually lead to work delays, increased project costs, loss of productivity and material waste and affect the quality of the project.

### B. Discussion:

As we have seen from the above observations and the three companies, the first large companies have better content management practice. However, due to materials, poor quality control teams, shipping issues and some seasonal issues of the industry, the delivery time was delayed, but it has better content management practice than medium and small firms and is encouraging. In some parts of the study, moreover, at the above points, they are presenting warranty claims to their customers and they use the principles of timely delivery (OTD). Initial deliveries without customer consent are defined as OTDs or delivered on time. However, according to the study, 80% of construction equipment management practices of large companies are used. The remaining 15% are not using the methods properly, but somehow, they are trying to use the management methods. Other companies are called medium companies. There is a big gap between large and medium-sized companies. From the outset, this intermediary company has been doing medium construction work based on its capacity. Therefore, we cannot expect large content management practice like large companies. Through investigation, 60% of the management tool used in the industry. The remaining 40% is reduced in volume somehow. However, in comparison, medium companies have less regulatory practice than larger ones. It affects the overall performance of buildings. In practice, we follow this from large and medium enterprises in the industry. The third and final companies are called small companies. Of these companies, from the data collected, only 40% of companies have management practice. This 40% is the average price for all small firms. In general, due to this low regulatory policy of the industry, structural factors affect buildings well. Small firms in the industry include the following. Construction delays, quality control, material shipment problems, material seasonal issues, cost overruns, labor strikes, communication problems and rising material prices are some of them.

The following chart shows the diversity of construction management tools in different organizations

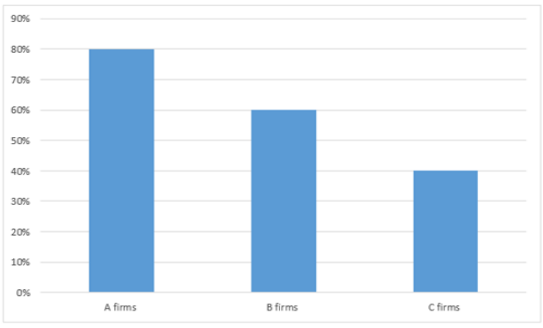


Fig.2. Diversity of construction management tools in different organizations

As we have seen from the above discussion, and from the chart, there is a big gap between the firms. The large firm has high material management practice. And we concluded that large firms were somewhat good and capable enough in managing materials in construction sites. And they use some techniques on materials management practices. Due to the material management techniques, OTD or on time delivery is highly applicable in large firms. On time delivery is a measure of process and supply chain efficiency which measures the amount of finished goods or services delivered to customers on time and in full.

Medium firms have somewhat good but it still needs improvements Medium firms have technical as well as some seasonal problems as they don't use any other techniques on the management of materials. Here, they used techniques of material management but lower than that of large firms. The cause of it is may be from cost or may be from working background of the site. And the last one is called small firms. It has very poor strategies in material management practice and it needs highly improved techniques. It has very poor management practice compared to medium & large firms. It is due to lack of skill man power, and may be has a limited power of working. And maybe they do not have enough efficiency to protect and to follow the well-being of the materials.

## V. INVENTORY MANAGEMENT

Modeling of inventory management in construction work, including on-site preparation of raw materials by Do Young Jung (2007). Research has been done to determine the optimal level of material innovation to take into account the powerful variations of resources under uncertainty for the economic viability of construction projects. This paper developed a proper inventory management model on the site construction process of raw materials such as the iron-rebar process. From research, it has been shown that the amount of iron and bar flow in the makeshift shop achieves stability during the inventory management phase by applying the bridge system, further reducing the average inventory size, and slowing down the holding time of assembled products from the start of construction / assembly operations by eliminating the optimal time, and Reduces inventory management costs by a total of 25%. To improve on-site tracking for inventory management in construction projects, Nareem Qasim (2012) conducted a research. Improper maintenance and storage of materials at the construction site is difficult to detect and detect. On-site content tracking and positioning using a traditional tracking approach is complex, labor-intensive, error-free, unreliable, and increases construction costs. Failure to maintain an on-site inventory will increase costs

and reduce overall project performance. They concluded that RFID in content tracking helps control inventory and outweighs project cost increases.

## VI. Techniques Of Material Management

S curve analysis was performed to examine deviations in scheduled project progress. Then tracking should be done and the fault should be detected in the first step. Aditya A. Pandey (2015) performed S Curve analysis using MSP software. S curve analysis was performed to compare schematic and actual material consumption. The deviation curve is a representation of the project path in the S-shaped graph, created by the increasing cost of some parameters against time. This analysis was done to compare the planned and actual costs for the materials. The author concludes that differences in materials can lead to purchases of materials that affect the budget of the project. EOQ analysis was performed after the project delay. Delays in scheduled projects. EOQ analysis was performed to mitigate the rising cost of the project. Ashwini R. Patil (2013) carried out this method and found consistent order quantities. You often need to know the order quantities to buy the required items in a timely manner. In addition, an order of frequency can also be obtained. Q, Economic order quantity C0 = ordering cost Cu = item cost S = total consumption I = inventory carrying cost using formula, inventory total cost and financial order quantity found. The cost obtained after receiving the EOQ analysis is lower than receiving the EOQ. Therefore, the cost is reduced and this analysis is recommended.

## VII. Conclusion & Recommendations

### *Conclusion*:

The following results were resolved from the study: A centralized content management team should coordinate between the site and the organization. Requires proper control, tracking and monitoring of the system. Create awareness and accountability in the organization. Effective integration is required in all aspects of content management practices. The appropriate materials management system has increased the overall efficiency of the industry by 35%. MMP is very important for the success of any mega project. This minimizes the difference between a successful project and a project full of delays and claims. It can be used to improve efficiency and reduce costs. It is used to control direct costs. This reduces the risk of inventory loss. And in general, it is the tool used to complete a project successfully and it leads to minimizing time and cost losses. Bhupathi (2016) conducted a study on materials management using a real-time residential project. The author believes that the cost of the project will increase mainly due to improper content management. So, in this project, planning, scheduling and budgeting were done by Primavera. Because they followed the correct scheduling method, there was no increase in project cost. The cost of the material is typically 50% of the total cost. The paper reports on Qasim's early stages of research as he develops a new ICT - based approach to managing content on fast - track projects. Care should be taken to complete their research planning, purchase, maintenance, storage and control in a timely manner with high efficiency. IT implementation in materials management facilitates successful and effective control of materials on site. They concluded that they preferred fast track construction to improve the efficiency of the production process.

### *Recommendation*:

The following recommendations have been addressed for construction companies of all sizes:

Work site management staff should pay more attention to content management, sometimes using software to avoid manual errors in content management, avoid delays due to rejection of materials by the quality control department or seasonal issues. Construction companies should store additional essential materials such as steel, cement etc. for emergency purpose, to avoid communication problems, all indents, requests, notes and records should be kept in written form.

Equipment such as conveyor belts, trolleys, cranes, etc. should be used to reduce wastage due to improper handling of materials. Then, it is recommended to prepare and follow the given procedure to implement content management effectively. Implementing a given process in content management is crucial for any mega project to be successful. To fill the gap between a successful project and this will reduce delays and clogged claims. It is used to improve efficiency and reduce costs, control direct costs, reduce the risk of inventory losses and is commonly used to control process cycles. This is called a Vale device and it loses direct labor time.

## References

[1]. DR. Kevin Aku Okorocha, “Factors Affecting Effective Materials Management in Building Construction Projects- a Case Study of Selected Building Sites, in Imo state, Nigeria”, International Journal of Management Sciences and Business Research, Vol. 2, Issue 4, pp. 50-59.

[2]. N.B. Kasim, C.J. Anumba and A.R.J. Dainty, “Improving Materials Management Practices on Fast-Track Construction Projects”, 21st Annual ARCOM Conference, SOAS, University of London. Association of Researchers in Construction Management, Vol. 2, September 2005, pp. 793-802.

[3]. Ashwini R. Patil, Smita V. Pataskar, "Analyzing Material Management Techniques on Construction Project", International Journal of Engineering and Innovative Technology, Vol. 3, Issue 4, October 2013, pp. 96-100.

[4]. T. Phani Madhavi, Steve Varghese Mathew, Roy Sasidharan, "Material Management in Construction – A Case Study", International Journal of Research in Engineering and Technology, Vol. 2. Issue 13, Nov-2013, pp. 400-403.

[5]. A. Gulghane, Prof P. V. Khandvi, "Management for Construction Materials and Control of Construction Waste in Construction Industry: A Review", Int. Journal of Engineering Research and Applications, Vol. 5, Issue 4 (Part -1), April 2015, pp.59-64.

[6]. Vikram Kulkarni, Rohit Sharma, Mohit Hot "Factors Affecting Material Management on Construction Site" International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 01 | Jan -2017. 1).

[7]. Sabihuddin, "Study of Material Management Techniques on Construction Project", International Journal of Informative & Futuristic Research ISSN (Online): 2347-1697, 2015. 2) S.

[8]. Angel Raphella, S. Gomathi Nathan and G. Chitra, "Inventory Management- A Case Study", International Journal of Emerging Research in Management &Technology ISSN: 2278-9359 (Volume-3, Issue-3), 2014. 3) S. Anup Wilfred.

[9]. M.D. Deepak,N. Shivaram, M. Nataraj and Yaseen Khan, "An empirical case study of material management in residential project", International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056, Volume: 02 Issue: 04, 2015. 4).

[10]. Anwar Zeb, Sohail Malik, Shazia Nauman, Hashim Hanif and Muhammad Osama Shahbaz Amin, "Factors Affecting Material Procurement, Supply and Management in Building Projects of Journal of Advanced Engineering Research and Studies, E-ISSN2249– 8974, 2014.

[11]. Pakistan: A Contractor's Perspective", Proceedings of 2015 International Conference on Innovations in Civil and Structural Engineering (ICICSE'15) Istanbul (Turkey), June 3-4, 2015 pp. 170-175, 2015. 5).

[12]. Ashwini. R. Patil and S. V Pataskar, "Analysing Material Management Techniques on Construction Project," vol. 3, no. 4, pp. 96–100, 2013. 6).

[13]. K. Boopathi and A. Krishnamoorthi, "Material management and cost analysis on construction project", IJMTES International Journal of Modern Trends in Engineering and Science, 2016. 7).

[14]. Calistus Ayegba, "An Assessment of Material Management on Building Construction Sites" Civil and Environmental Research www.iiste.org ISSN 2224-5790 (Paper) ISSN 2225-0514 (Online) Vol.3, No.5, 2013. 8)

[15]. Dipak P. Patil, Pankaj P. Bhangale and Swapnil S. Kulkarini, "Study of cost control on construction project", International Journal of Advanced Engineering Research and Studies, E-ISSN2249– 8974, 2014.9).